

RECEIVED
CENTRAL FAX CENTER

JUL 01 2004

OFFICIAL

Y0R9200000789US1
(20140-00272-US1)
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Arpan P. Mahorowala et al.

Application No.: 09/902,728

Art Unit: 1756

Filed: July 12, 2001

Examiner: Barreca, Nicole M

For: METHOD TO PREVENT PATTERN
COLLAPSE IN FEATURES ETCHED IN
SULFUR DIOXIDE-CONTAINING PLASMASDECLARATION UNDER 37 CFR § 1.131Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Arpan P. Mahorowala, a co-inventor of the invention defined in U.S. patent application 09/902,728 hereby declare that:

1. I have reviewed and understand the contents of the Office Action dated 04/01/2004.
2. I understand that the Examiner has rejected claims 1-3, 7-17, and 20-21 under 35 U.S.C. § 103(a) as being anticipated by Ngo et al. (US 6,528,432) ("Ngo") with Linn (5,833,758) cited to show inherency.¹
3. I understand that the Examiner has rejected claims 4-6 under 35 U.S.C. § 103(a) as being unpatentable over Ngo (Linn cited for inherency) in view of Allen (5,985,524) and further in view of Ni (6,465,159).

¹ Note: Examiner's Point 8 recites § 102(e). However, Point 8 is located in the section headed "Claim Rejections - 35 USC § 103." Moreover, Examiner's Point 6 notes that the previous § 102 rejection over Ngo has been changed to a rejection under § 103. For purposes of response, the Inventor assumes Point 8 relates to a rejection under § 103.

09/902,727

1

4. Ngo forms the basis for each of the rejections cited in the Office Action.
5. Ngo was filed December 5, 2000.
6. I declare that the present invention was conceived prior to the filing of the Ngo reference and was pursued with diligence from the time of conception until the filing date of the present application.
7. Evidentiary support for conception and diligence prior to the Ngo filing is provided in the application as filed. Figure 4 of the application comprises two electron micrographs. Each electron micrograph is provided indicia emplaced by the automatic camera system used to take the pictures. Each micrograph is dated 7-Jul-00 (July 7, 2000).
8. The specification, as originally-filed, described Figure 4 in such manner that a person of skill would know that the inventor, at the time of taking the micrograph, was in possession of the invention. The specification discloses that Figure 4 is an electron micrograph taken following the completion of each of the steps of the inventive method. The specification recites:²

Turning now to Figure 4. The advantages conferred by the inventive method are confirmed by SEM pictures taken 7 days post treatment. The inventive method provides a means to stabilize high aspect ratio, post-etch lithographic images against collapse, the method comprising the steps of: (a) coating a substrate with an organic underlayer; (b) coating said underlayer with a photoresist wherein said photoresist comprises a stable, etch resistant, non-volatile oxide-forming material selected from the group consisting of silicon, phosphorous, germanium, aluminum, and boron; (c) imagewise exposing said photoresist to radiation; (d) developing an image in said photoresist; (e) transferring said image through said underlayer into said substrate thus forming a high aspect ratio resist image; and the improvement comprises (f) treating said high aspect ratio resist image with a chemically reducing plasma. A preferred chemically-reducing plasma comprises a species, such as ethylene, capable of generating hydrogen when excited into the plasma state. A more preferred chemically-reducing plasma comprises hydrogen. No pattern collapse is observed up to a week post treatment indicating that the H₂ plasma successfully removed and/or chemically reduced most if not all of the hygroscopic sulfite/sulfate species.

² Specification, page 6, lines 3-17.

9. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both under 18 U. S. C. § 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date: June 4, 2004Signature: 

Arpan P. Mahorowala

09/902,727

3

*** TOTAL PAGE, 05 ***